



**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

in re application of:

**TERRY ZOUBOULAKIS**

Serial No.: 10/664,177  
Filed: September 17, 2003  
For: PNEUMATIC PAINTBALL MARKER, UNIVERSAL BARREL,  
ADAPTOR AND INSERT COMBINATION  
GAU: 3711

Attorney Docket: **1761-004P/FS3**

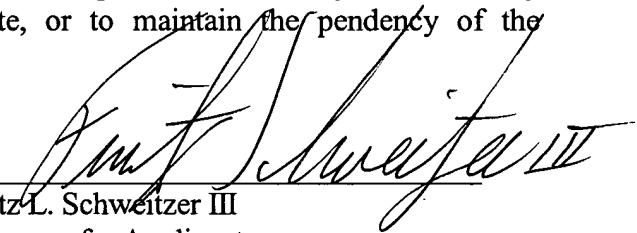
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

SIR:

Enclosed is a certified copy of the priority Canadian Application No. 2,440,556, filed September 9, 2003, in the above-identified application.

The Commissioner is hereby authorized to charge in the future any fee deficiency which is indispensable to obtain a filing date, or to maintain the pendency of the application, to our deposit account No. 19-0748.

**Customer No. 022831**  
**SCHWEITZER CORNMAN**  
**GROSS & BONDELL LLP**  
292 Madison Avenue, 19<sup>th</sup> Floor  
New York, New York 10017  
Tel.: (646) 424-0770  
Fax: (646) 424-0880

  
Fritz L. Schweitzer III  
Attorney for Applicant  
Registration No. 39,363

I hereby certify that this paper or fee is being deposited with the U.S. Postal Service as First Class Mail on the date indicated below and is addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.  
Mailing Date: April 13, 2004

  
Gerri De Luca



Office de la propriété  
intellectuelle  
du Canada

Un organisme  
d'Industrie Canada

Canadian  
Intellectual Property  
Office

An Agency of  
Industry Canada

*Bureau canadien  
des brevets  
Certification*

La présente atteste que les documents  
ci-joints, dont la liste figure ci-dessous,  
sont des copies authentiques des docu-  
ments déposés au Bureau des brevets.

*Canadian Patent  
Office  
Certification*

This is to certify that the documents  
attached hereto and identified below are  
true copies of the documents on file in  
the Patent Office.

Specification and Drawings, as originally filed, with Application for Patent Serial No:  
**2,440,556**, on September 9, 2003, by **TERRY ZOUBOUKAKIS**, for "Pneumatic Paint  
Ball Marker, Universal Barrel, Adapter and Insert Combination".

Agent certificateur/Certifying Officer

March 29, 2004

Date

Canada

(CIPO 68)  
04-09-02

OPIC  CIPO

**ABSTRACT**

The present invention comprises a pneumatic paintball marker for use with an adaptor, the pneumatic paintball marker comprising a marker body which has a back portion and a front portion. The back portion is adapted to receive a paintball and the front portion is adapted to detachably connect with a barrel to discharge a paintball through the barrel. The barrel comprising a hollow elongated cylindrical tube, which comprises an interior diameter, a breech end and a connection means at the breech end and adapted for connection with the front portion of the marker and a paintball discharge muzzle end.

# **PNEUMATIC PAINTBALL MARKER, UNIVERSAL BARREL, ADAPTOR AND INSERT COMBINATION**

## ***Field of the Invention***

This invention relates to the use of an adaptor in a pneumatic paintball marker in  
5 combination with a universal barrel, removable tubular barrel sleeve inserts and  
exchangeable variable length muzzle ends.

## ***Background of the Invention***

The popularity of the recreational sport of paintball has risen significantly over the last  
few years. Tournaments are now being scheduled almost every weekend and  
10 professional national and international paintball competitions are becoming more and  
more popular. All cites, whether large or small are seeing indoor paintball fields  
being built in addition to the many outdoor playing fields. With the increase in  
popularity of this sport, the caliber of the players has also increased significantly.  
Players are now equipping themselves with top-of-the-line protective gear, paintball  
15 markers and accessories.

A paintball game requires that each player have a paintball marker and as many  
paintballs as they can carry. There are numerous types of scenarios that can be  
played out during a paintball game whether as part of a team or individually, but, in  
essence, the objective is avoiding to be marked by a paintball. Once marked, a  
20 player is removed from the game. The last unmarked player or team remaining on  
the field at the end of the allotted time is the winner of the game.

Pneumatic paintball markers discharge a paint filled paintball capsule from a paintball  
marker, through the breech end of the barrel portion, into the barrel and the paintball  
is then projected out of the muzzle end of the barrel towards its intended target. A  
25 paintball being discharged from a pneumatic paintball marker should reach an  
approximate velocity of 300 feet per second using as little resources as possible,  
such as compressed air or nitrogen, which is largely determined by the paintball  
barrel and as such shooting more accurately. Thus, the type of paintball barrel  
selected by a player is one of the most important pieces of equipment.

30 Paintballs can vary in size and are usually made of a non-toxic, water-soluble  
biodegradable paint. U.S. Patents N<sup>o</sup> 4,656,092; 5,353,712, and 5,823,173 are  
directed to fluid-filled capsule marking paintballs. Thus, when an opponent is marked

with these types of paintballs, the fluid-filled capsules burst and the paint is released and marks the opponent. Although paintball capsules appear to be spherical in shape and can have a diameter of between 0.670 inches to 0.695 inches, they are never perfectly round and each paintball manufactured varies in diameter. The

5 inconsistency in the diameters of paintball capsules is because the paintballs must be sufficiently rigid to withstand being projected from a paintball marker while, at the same time, sufficiently fragile to break upon impact with the intended target. Furthermore, the change in ambient temperature and humidity will also cause the paintball to change in size. Moreover, every paintball manufacturer will make a

10 different paintball once again resulting in variations in paintball sizes, which further adds to the importance of the barrel. It is extremely important to match the size of the paintballs that are being used with the size of the inner diameter of the barrel because too tight a fit will decrease the velocity and the travel/projectile distance of the paintball, in addition to possibly breaking the paintball within the barrel. Too

15 loose a fit will also decrease the velocity, distance and accuracy of the paintball due to air loss between the paintball and the inside diameter of the barrel. Moreover, a loose fit may also cause the paintball to simply fall out of the barrel. Therefore, it is desirable that a barrel for a paintball be adapted to account for the various dimensions of paintball capsules.

20 As such, paintball barrels are available with different internal diameters to accommodate the different sizes and fluctuations of temperature. Barrels are also available in different lengths to improve on distance and accuracy. The drawback to conventional barrels are that a player would need approximately fifteen barrels to accommodate the different paintball sizes and barrel lengths. As barrels are usually

25 fairly long and heavy, this extra equipment would make it inconvenient and uncomfortable for a paintball player. In addition, most barrels are expensive, thus the need for multiple barrels would significantly increase the costs associated with this sport.

U.S. application 10/274,075, and U.S. Patent N° 6,494,195 disclose a barrel

30 assembly for a pneumatic paintball gun comprising a barrel body and a barrel insert. The barrel insert collaborates with the barrel body to provide a firing bore for the barrel assembly; the insert guides a paintball fired from the breech end of the gun through the barrel and out the muzzle end of the barrel body. Although this application does deal with the problem of having to carry multiple barrels in order to

35 be able to adapt to the various sizes of paintballs, the inserts described do not extend

through the majority of the barrel's overall length. Thus they fail to adequately stabilize the paintball path and sufficiently address the changes to the paintball shape caused by fluctuations in temperature or inconsistencies in the manufacturing of paintballs.

- 5 In addition, based on the art in the field of paintball markers, should a player decide to change the make of his/her pneumatic paintball marker, the corresponding barrel can no longer be used with the new marker because the connecting means on the new marker is not compatible with the old barrel. Thus, there is a need to accommodate paintball players by providing them with adaptor(s) that can be used  
10 on various markers. Therefore, there is a need for the use of adaptor(s) in combination with a universal barrel and one or more removable tubular barrel sleeve inserts and exchangeable variable length muzzle ends.

### ***Summary of the Invention***

- 15 It is an object of the present invention to provide for the use of adaptor (s) in combination with a pneumatic paintball marker, a detachable universal barrel, one or more removable tubular barrel sleeve inserts, an adaptor and exchangeable variable length muzzle ends.

- Another object of the present invention is to allow a paintball player to easily adapt the inside diameter of the barrel to the paintball capsules diameter by inserting a  
20 removable tubular sleeve in accordance with the diameter of the paintballs being used.

A still further object of the present invention is to allow a paintball player to change paintball markers easily and conveniently without the need of re-purchasing a multiplicity of barrels.

- 25 A still further object of the present invention is to improve the accuracy of the projection of a paintball discharged from a paintball marker.

An additional object of the present invention is to provide a kit comprising a detachable universal barrel, one or more adaptor(s), one or more removable tubular barrel sleeve inserts and one or more exchangeable variable length muzzle ends.

30

A still further object of the present invention is the ability to project paintballs using less resources, such as nitrogen, compressed air etc., thus extending the playing time.

- 5 It is still a further object of the present invention to provide adaptor(s) that can be adaptably connected to almost any existing paintball marker such that the detachable universal barrel can be used without substitution.

The present invention comprises a pneumatic paintball marker for use with an adaptor, the pneumatic paintball marker comprising a marker body which has a back  
10 portion and a front portion. The back portion is adapted to receive a paintball and the front portion is adapted to detachably connect with a barrel to discharge a paintball through the barrel. The barrel comprising a hollow elongated cylindrical tube, which comprises an interior diameter, a breech end and a connection means at the breech  
end and adapted for connection with the front portion of the marker and a paintball  
15 discharge muzzle end.

The improvement consists of the use of an adaptor which will permit a paintball player to connect a detachable universal barrel to a paintball marker. In a preferred embodiment, the adaptor comprises a body with a hollow cylindrical tube, a marker  
end adapted for connection with the front portion of the marker and a barrel  
20 connection for connection with a universal barrel adapted for detachable connection with the adaptor. The body of the adaptor has an internal diameter equal to the internal diameter of the universal barrel.

There are one or more removable tubular barrel sleeve inserts adapted to be inserted into the adaptor and universal barrel and to extend the entire length within the  
25 universal barrel and the adaptor. These inserts comprise a hollow elongated tube with an inside diameter and an outside diameter, the outside diameter being slightly smaller than the internal diameter of the universal barrel and adapted to form a continuous path for the projection of a paintball discharged from a paintball marker. The inserts can be made from, for example, any material, such as aluminum, brass,  
30 bronze, Teflon or any suitable material that will be able to accommodate the various sizes of the paintballs. The inside of the inserts may be coated with ceramic, oil or Teflon or any suitable material that will provide a smooth lubricated surface for an improved projection of the paintball. The inserts extend from the beginning of the marker end of the adaptor through the universal barrel. The inserts may be of  
35 various lengths and preferably extend up to 12 inches long or more and have an

inside diameter that may vary from at least about 0.670 inches to at least about 0.695 inches. The inserts can be inserted in any direction and can be secured in place by screwing the muzzle end which in turn secures the insert between the marker and the muzzle.

- 5 The invention also contemplates a pneumatic paintball kit for use with a pneumatic paintball marker comprising a marker body having a back portion and a front portion. The back portion of the marker body is adapted to receive a paintball and the front portion is adapted to detachably connect with a barrel to discharge a paintball through the barrel. The barrel comprising a hollow elongated cylindrical tube with an
- 10 interior diameter, a breech end and a connection means at the breech end and adapted for connection with the front portion of the paintball marker and a paintball discharge muzzle end. The kit comprises a universal barrel having a hollow elongated cylindrical tube with an interior diameter, a breech end and a connection means at the breech end and adapted for connection with the front portion of the
- 15 marker and a paintball discharge muzzle end. There is also at least one adaptor comprising a body with a hollow cylindrical tube. Each adaptor comprises a marker end adapted for connection with the front portion of a marker and a barrel connection for connection with a universal barrel adapted for detachable connection with the
- 20 adaptor. The body of all the adaptors has an internal diameter equal to the internal diameter of the universal barrel. The kit further comprises one or more removable tubular barrel sleeve inserts adapted to be inserted within the adaptor, the universal barrel and to extend the entire length within the universal barrel, and the adaptor. The inserts comprising a hollow elongated cylindrical tube with an inside diameter and an outside diameter, the outside diameter is slightly smaller than the internal
- 25 diameter of the universal barrel, and the adaptor to form a continuous path for the projection of a paintball discharged from the paintball marker. In another embodiment, the kit comprises an interchangeable muzzle extension that is adapted for connection at the muzzle discharge end of the universal barrel.

### ***Brief Description of the Drawings***

- 30 Figure 1 is a side view of a universal barrel, adaptor, removable tubular barrel inserts and a muzzle extension combination for a pneumatic paintball marker.

Figure 2 is a cross-section side view of one of the adaptors of the present invention.

- 35 Figure 3 is a cross-sectional view of another adaptor contemplated by the present invention.



Figure 4 is a perspective view of the removable tubular sleeve inserts contemplated by the present invention.

5 Figure 5 is a perspective view of the muzzle extension pieces contemplated by the present invention.

Figure 6 is a cross-section view of one of the removable tubular barrel sleeve inserts contemplated by the present invention.

10 Figure 7 is a perspective view of the universal barrel contemplated by the present invention.

### ***Detailed Description***

The foregoing objects and advantages of the present invention will become more readily apparent from the following detailed description of the preferred embodiments made in reference to the attached figures.

15 Figures 1 and 7 show a pneumatic paintball universal barrel (1) of the present invention. The universal barrel (1) comprises a breech end (7) and a discharge muzzle end (8). The universal barrel (1) has an interior diameter (17) and comprises a hollow elongated cylindrical tube (4) that extends from the breech end (7) to the discharge muzzle end (8). The breech end (7) of the universal barrel (1) has a connection means (11) adapted for connection with barrel connection (12) of the adaptor (3). The adaptor (3) is adapted for connection to the front end of the marker by a connection means. The discharge muzzle end (8) of the universal barrel (1) is located at the opposite end of the marker (not shown) and allows for a paintball to discharge from the back portion of the marker body through the front portion of the marker body through the insert (4) which is embodied by the adaptor (3) and then through the universal barrel (1) and finally through the muzzle (2) to mark its intended target.

The adaptor (3) can be adapted to connect to the breech end (7) of the universal barrel (1) by reverse screwing the internal threads (12) on the adaptor (3) barrel connection to the breech end of the universal barrel (1). The internal threads (12) of the barrel connection (6) of the adaptor (3) are identical on all adaptors (3) contemplated by the present invention and only connect to the breech end (7) of the universal barrel (1). The marker end (5) on the adaptor (3) comprises an external thread (13) that is adapted to accommodate the many different types of pneumatic paintball markers on the market. Depending on the marker diameter, an appropriate

adaptor in the kit will be used. As contemplated by the present invention, a kit will comprise one or more adaptors, to correspond with the size the majority of available markers on the market. This allows a paintball player to change marker bodies without requiring a player to purchase a new barrel due to the different threads on the marker. The means of connection of the marker end (13) of the adaptor (3) can be of any numerous types as shown in Figure 2 and 3. For example, but not limited to, a snap-on type connection means, a cam-lock connection means or a threaded connection means.

As shown in Figures 1, 4 and 6, a removable tubular barrel sleeve insert (4) is adapted to be inserted into the universal barrel (1) and to extend the entire length of the universal barrel (1) and adaptor (3). The insert (4) can be of any length, but must extend the entire length of the universal barrel (1) and adaptor (3). The insert comprises a hollow elongated tube with an inside diameter (14) and an outside diameter (15). The outside diameter (15) of the insert is slightly smaller than the inside diameter (17) of the universal barrel (1) and adaptor (3). When the insert (4) is inserted into the universal barrel (1), it forms a continuous path for the projection of a discharged paintball from a paintball marker. The inside diameter (14) of the insert (4) is selected to provide a snug fit with the paintball being fired from the paintball marker. Preferably, the choice of insert (4) is directly dependent on the size of the paintball to be fired. If the internal diameter of the insert (4) is too large, there will be a decrease in velocity, distance and accuracy. A too loose a fit may also cause the paintball to fall out of the universal barrel. If the inside diameter (14) of the insert (4) is too small, the velocity of the paintball will also be decreased and the paintball may also break within the universal barrel. Furthermore, a snug fitting insert chosen in association with a particularly sized paintball will ensure that the flow of compressed gas is properly transferred to the paintball, as the paintball is pushed through the insert (4) toward the discharge muzzle end (8) of the universal barrel (1). The inserts (4) can be made from, for example, any material, such as aluminum, bronze, brass or Teflon or any suitable material that will be able to handle the paintball during its projection through the insert (4). The inside of the inserts may be coated with, for example, ceramic, oil or Teflon, or any suitable material that will result in a smooth lubricated surface for the projection of the paintball through the insert. The inserts extend from the beginning of the marker end of the adaptor and through the entire universal barrel. The inserts may be of various lengths and extend up to 12 inches long or more and the inside diameter of the inserts may vary from at least 0.670 inches to about at least 0.695 inches as shown in Figures 4 and 6. Furthermore, there are at least seven different types of inserts (4) having different inside

diameters (14) which fit the various sizes of paintballs manufactured and can easily be inserted into and extend the entire length of the universal barrel (1) and adaptor (3).

Figure 4 shows a set of inserts (4) having a variety of inside diameters (14). A preferred set of inserts includes at least five-barrel inserts. A first insert has an inside diameter of 0.682 inches. A second insert has an inside diameter of 0.684 inches. A third insert has an inside diameter of 0.686 inches. A fourth insert has an inside diameter of 0.688 inches. A fifth insert has an inside diameter of 0.690 inches. A sixth insert has an inside diameter of 0.692 inches. A seventh insert has an inside diameter of 0.694 inches. Other various sized inserts are also contemplated by the present invention. The invention is also a kit (20) as shown in Figure 1. In the kit (20), there is one or more adaptor(s) (3), each having a marker end (5) adapted for connection with existing markers on the market one or more inserts (4) that are inserted into the barrel of the marker and one or more muzzles (2). In a preferred embodiment, the connection means on the marker end of the adaptor comprises a thread that is adapted for connection with the selected marker. The adaptor (3) also comprises a barrel connection (6) having an internal thread adapted for connection with the universal barrel (1). A player may use the kit (20) by selecting the appropriate adaptor (3) in accordance with the marker that they intend to use. A player can also select the appropriate insert (4) in accordance with the size of paintball to be used with the paintball marker. At all times the same universal barrel may be used. In a different embodiment, the player can increase the length of the universal barrel (1) by connecting a muzzle extension (2) at the discharge muzzle end (8) of the universal barrel (1). The muzzle extension (2) has progressive vented holes (9) near the firing end (21) of the muzzle extension (2). The progressive vented holes (9) help decrease the noise when the paintball is being discharged from the paintball marker.

This invention provides paintball players with an inexpensive and easy method for using a universal barrel, an adaptor and removable tubular barrel sleeve inserts, and exchangeable variable length muzzle ends in combination with multiple markers on the market.

Having thus described the invention, it should be apparent that many structural adaptations may be implemented without departing from the scope of the present invention as set forth above and as described herein below by the claims.

**WE CLAIM:**

1. In a pneumatic paintball marker comprising a marker body comprising a back portion and a front portion, the back portion adapted to receive a paintball, the front portion adapted to detachably connect with a barrel to discharge a paintball through the barrel, said barrel comprising a hollow elongated cylindrical tube with an interior diameter, a breech end and comprising a connection means at the breech end and adapted for connection with the front portion of the marker and a paintball discharge muzzle end, the improvement comprising:

10

- o an adaptor having a body with a hollow cylindrical tube and having two threaded ends,

15

- o a marker end adapted for connection with the front portion of the marker and a barrel connection for connection with a universal barrel adapted for detachable connection with said adaptor, said body having an internal diameter equal to the internal diameter of the universal barrel; and

20

- o one or more removable tubular barrel sleeve inserts adapted to be inserted with the adaptor and universal barrel and to extend the entire length within the universal barrel and the adaptor,

25

- o said inserts comprising a hollow elongated tube with an inside diameter and an outside diameter, the outside diameter being slightly smaller than the internal diameter of the universal barrel and adapted to form a continuous path for the projection of a paintball discharged from a paintball marker.

2. The pneumatic paintball marker of claim 1, wherein the inserts have an inside diameter from at least about 0.670 inches to at least about 0.695 inches.

30

3. In a pneumatic paintball marker comprising a marker body having a back portion and a front portion, the back portion is adapted to receive a paintball, the front portion is adapted to detachably connect with a barrel to discharge a paintball through the barrel, said barrel comprising a hollow elongated cylindrical tube with an interior diameter, a breech end and a connection means at the breech end and adapted for connection with the front portion of the marker and a paintball discharge muzzle end, the improvement comprising:

an adaptor having a body with a hollow cylindrical tube, a marker end adapted for connection with the front portion of the marker and a barrel connection for connection with a universal barrel adapted for detachable connection with said adaptor, said body having an internal diameter equal to the internal diameter of the universal barrel;

one or more muzzle extensions comprising a hollow cylindrical body, a discharge end and a muzzle end adapted for connection with the muzzle end of the universal barrel for detachable connection with said muzzle extensions; and

one or more removable tubular barrel sleeve inserts adapted to be inserted within the adaptor, and the universal barrel to extend the entire length within the universal barrel, the adaptor, said inserts comprising a hollow elongated cylindrical tube with an inside diameter and an outside diameter, the outside diameter being slightly smaller than the internal diameter of the universal barrel, the adaptor to form a continuous path for the projection of a paintball discharged from the paintball marker.

4. The pneumatic paintball marker of claim 3, wherein the inserts have an inside diameter from at least about 0.679 inches to at least about 0.695 inches.

5. The pneumatic paintball marker of claim 3, wherein the muzzle extensions are of various lengths.

6. A pneumatic paintball kit for use with a pneumatic paintball marker comprising a marker body comprising a back portion and a front portion, the back portion is adapted to receive a paintball, the front portion is adapted to detachably connect with a barrel to discharge a paintball through the barrel, said barrel comprising a hollow elongated cylindrical tube comprising an interior diameter, a breech end and comprising a connection means at the breech end and adapted for connection with the front portion of the marker and a paintball discharge muzzle end, the kit comprising:

(a) a universal barrel comprising a hollow elongated cylindrical tube comprising an interior diameter, a breech end and comprising a connection means at the breech end and adapted for connection with the front portion of the marker and a paintball discharge muzzle end;

(b) one or more adaptors comprising a body with a hollow cylindrical tube, a marker end adapted for connection with the front portion of the marker and a barrel connection for connection with a universal barrel adapted for detachable connection with said adaptor, said body having an internal diameter equal to the internal diameter of the universal barrel;

- (c) one or more muzzle extensions comprising a hollow cylindrical body, a discharge end discharge said paintball and a muzzle end adapted for connection with the muzzle end of the universal barrel for detachable connection with said muzzles; and
- 5 (d) one or more removable tubular barrel sleeve inserts adapted to be inserted within the adaptor, and the universal barrel to extend the entire length within the universal barrel, the adaptor, said inserts comprising a hollow elongated cylindrical tube with an inside diameter and an outside diameter, the outside diameter being slightly smaller than the internal diameter of the universal barrel, the adaptor to form a continuous path for the projection of a paintball discharged from the paintball marker
- 10 wherein the marker end of each of the adaptors is adapted for connection to the breech end of the universal barrel and the muzzle extension is adapted for connection with the discharge muzzle end of the universal barrel and the insert is adapted to be inserted within the adaptor, the universal barrel, to form a continuous path for the projection of a paintball discharged from a paintball marker.
- 15 7. The pneumatic kit of claim 6, comprising more than one adaptor, wherein the marker end of each of the adaptors is of different connection types.
- 20 8. The pneumatic kit of claim 6, wherein the muzzle extensions can be of various lengths.
9. The pneumatic kit of claim 6, wherein each inserts has an inside diameter from at least about 0.670 inches to at least about 0.695 inches.
- 25 10. Use of an adaptor with a pneumatic paintball marker comprising a marker body comprising a back portion and a front portion, the back portion adapted to receive a paintball, the front portion adapted to detachably connect with a barrel to discharge a paintball through the barrel, said barrel comprising a hollow elongated cylindrical tube comprising an interior diameter, a breech end and comprising a connection means at the breech end and adapted for connection with the front portion of the marker and a paintball discharge muzzle for use with an adaptor comprising a body with a hollow cylindrical tube, a marker end adapted for connection with the front portion of the marker and a barrel connection for connection with a universal barrel adapted for detachable connection with said adaptor, the internal diameter of said body being equal to the internal diameter of the universal barrel.
- 30 11. The use of an adaptor of claim 10, wherein the marker end comprises an external thread adapted for connection with the front portion of the marker to allow for
- 35

interchangeability between marker bodies and the barrel end comprises an internal thread that reverse screws into the universal barrel to form a continuous path for the projection of a paintball discharged from a paintball marker.

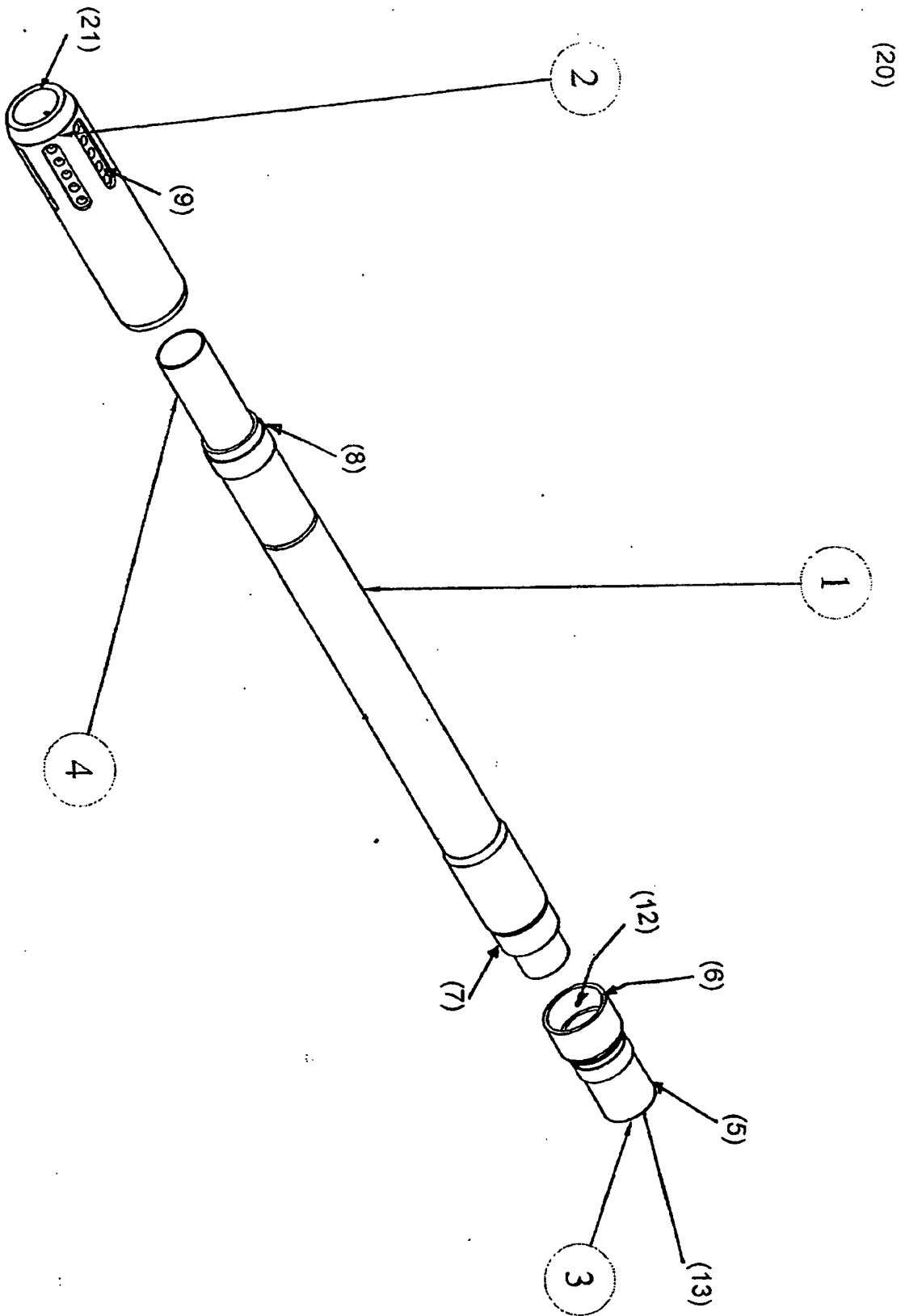


Figure 1



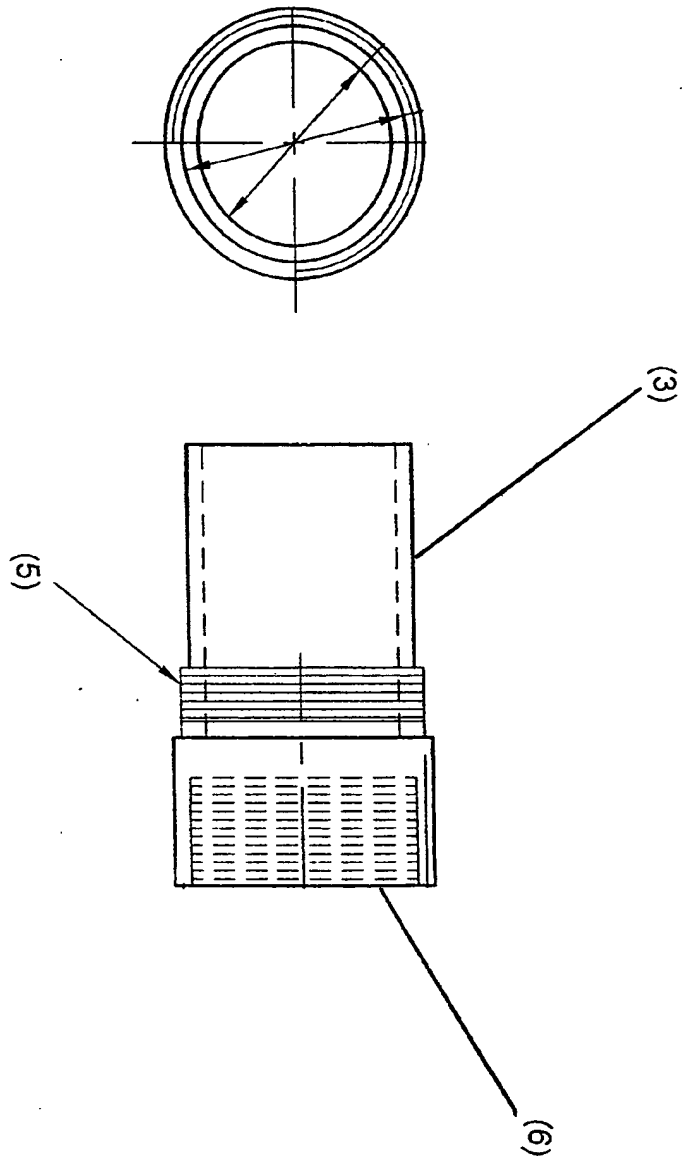


Figure 2

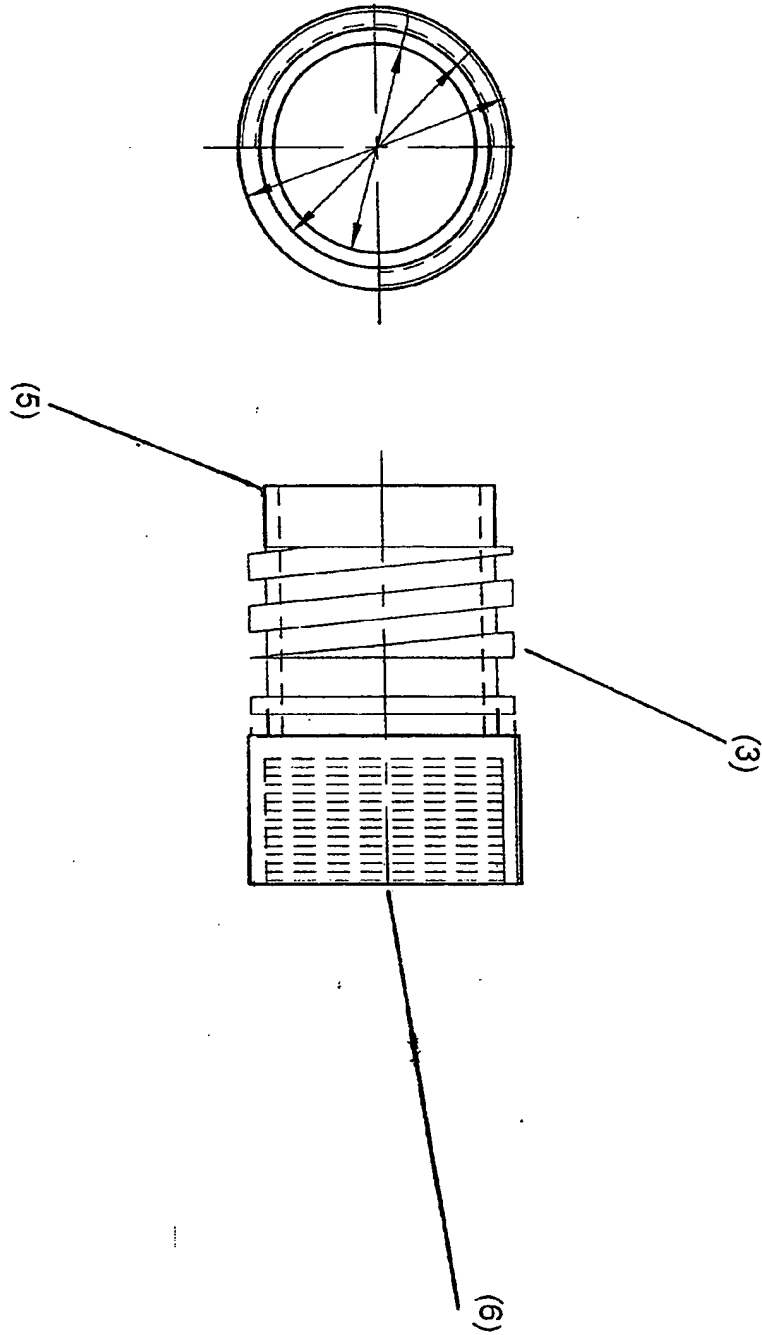


Figure 3

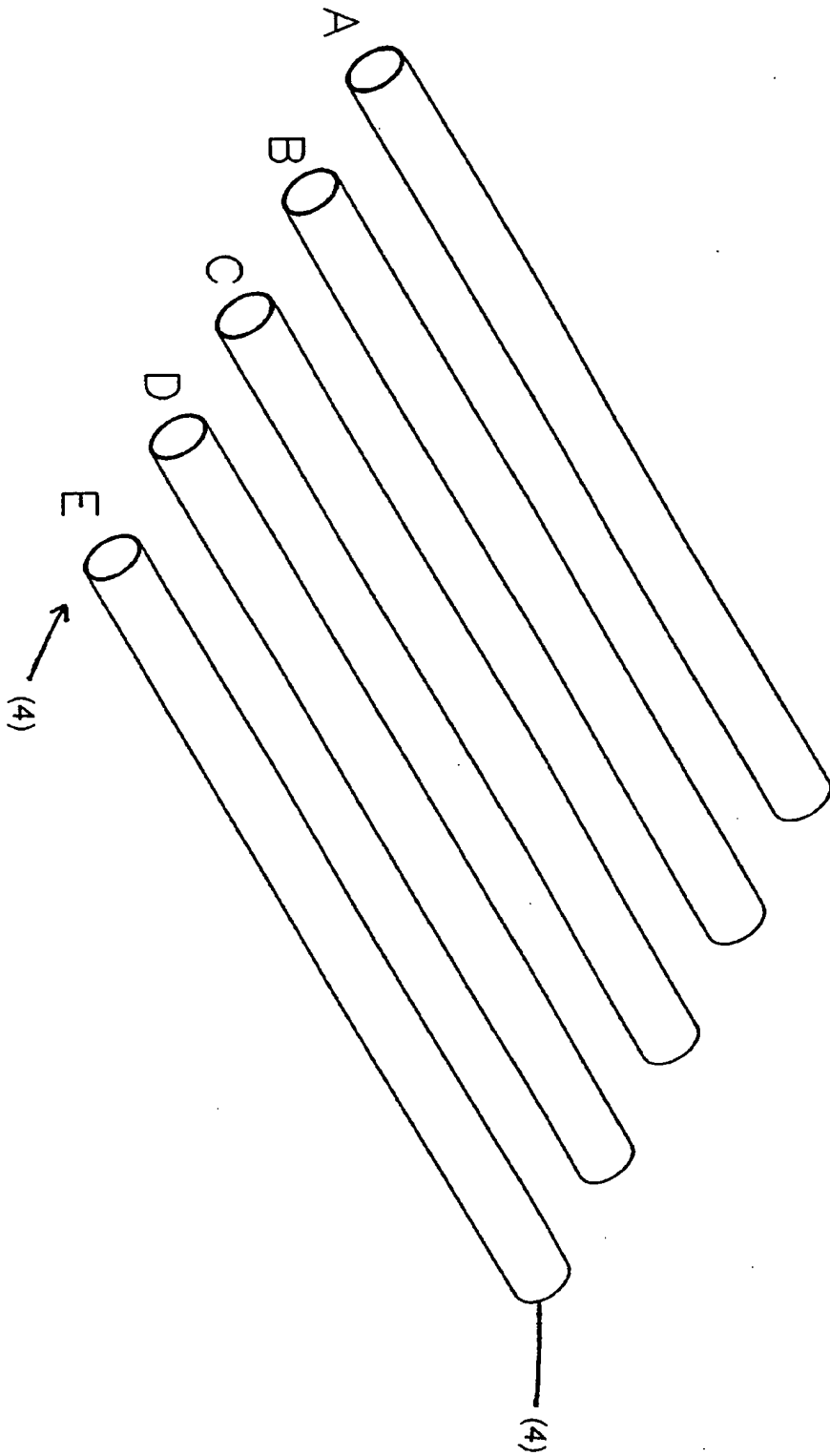
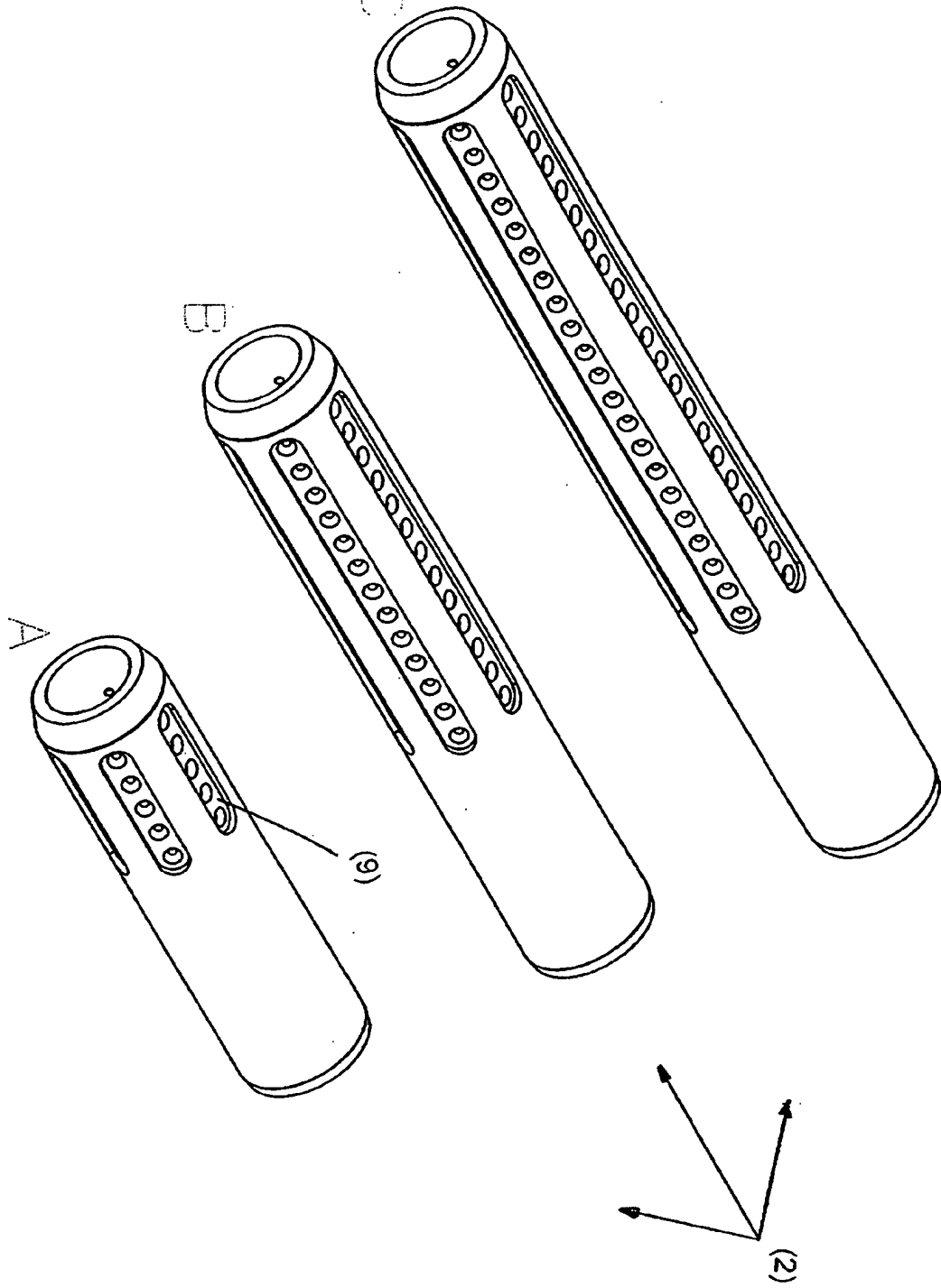
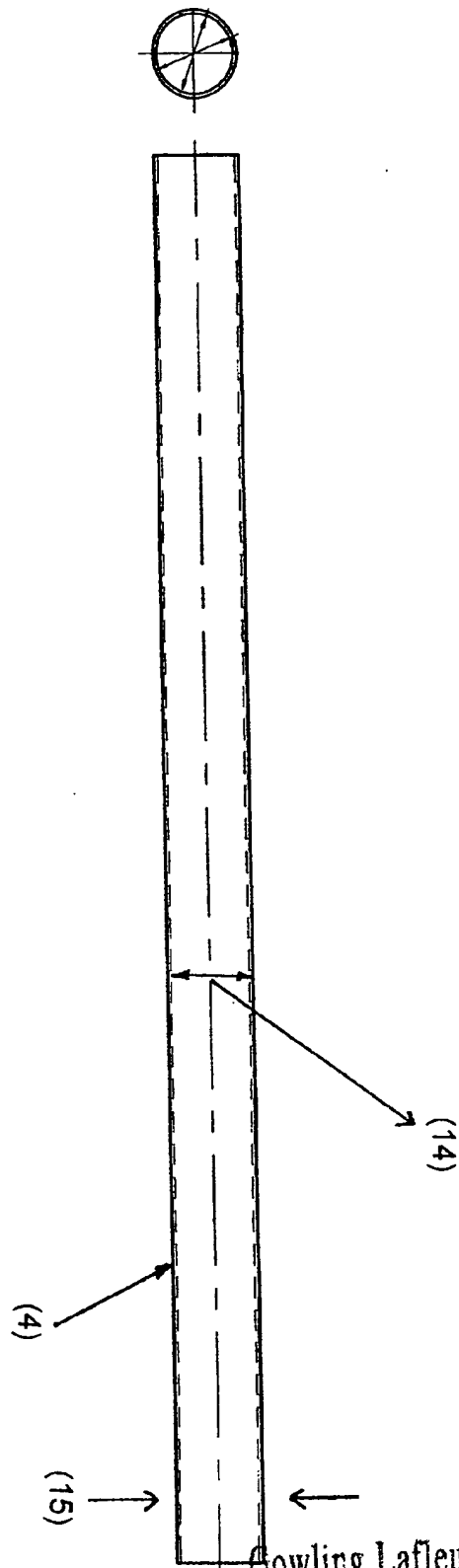


Figure 4

Figure 5





Gowling Lafleur Henderson LLP

Figure 6

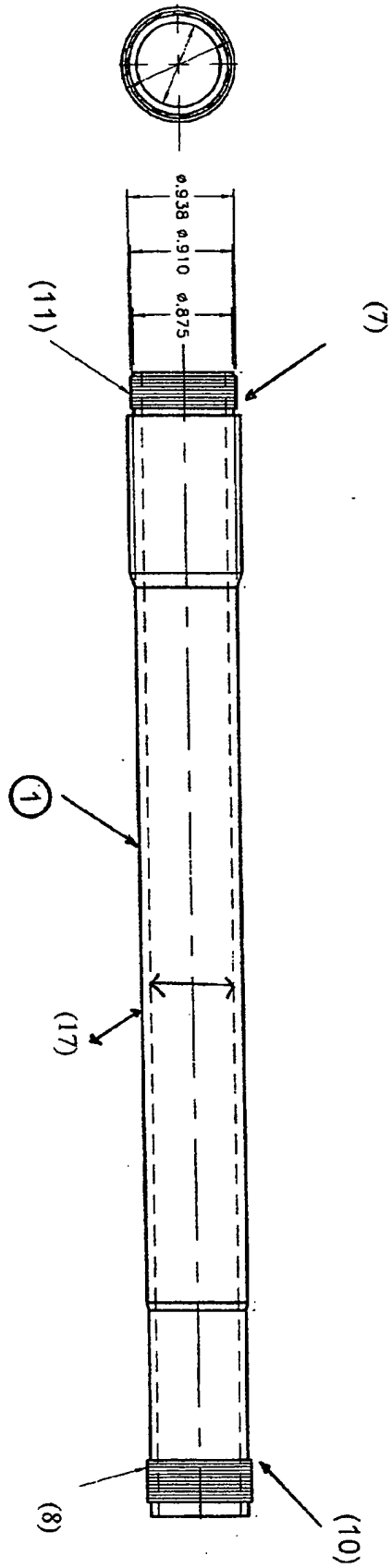


Figure 7